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Biologic Notes on Certain Iowa Insects

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MELAMPSALTA PARVULA SAY.

This interesting little species has been taken once at Ames and this is, so far as I know, the only record of its occurrence in the state. It is a more southern form, being credited to the southern states as far north as southern Illinois and central Kansas. Very likely it may be found occasionally in the southern part of the state when collectors become more plentiful.

Any addition to these records will be gratefully received and duly credited in future records.

BIOLOGIC NOTES ON CERTAIN IOWA INSECTS.

HERBERT OSBORN AND C. W. MALLY.

The following notes are extracted from Bulletin 32 of the Iowa Experiment Station, and embrace such portions of work upon certain injurious insects as have a biologic interest. We are indebted to the Experiment Station for the use of the figures.

THE GROUND CHERRY SEED MOTH.

(*Gelechia sp.*)

Our attention was called to this insect by Dr. J. C. Milnes, of Cedar Rapids, who reported it as very destructive on wild ground cherries under cultivation; writing further, that this cherry being very prolific and of excellent quality would be a desirable garden plant were it not for the great injury from this pest. The specimens sent contained the insect in the pupa stage.

Cultivated ground cherry at Ames suffered from similar attack, and the pest seems likely to occasion much loss.

Examination of wild ground cherries in the vicinity of Ames revealed a considerable injury from the pest, and steps were taken to secure the early stages and determine as fully as possible the habits of the insect.

Out of 1,000 berries examined 130, or 13 per cent were infested. All of these infested berries contained the pupæ enclosed in a white silken cocoon which filled most of the cavity of the berry, the seeds being entirely devoured. Near the stem end of the berry and opposite the head of the pupa was an opening presumably prepared for the emergence of the moth.

Observations on these berries would favor the conclusion that the larvæ develop within a single berry, no injured berries being found which did not contain pupæ. However, two berries were found with an opening on the side and containing well developed larvæ with very little of the inside of the berry devoured, suggesting that the larvæ, under exceptional conditions migrate from a berry of insufficient food material to a fresh one.

But very few larvæ were found and these during the last week in September. They were at that time mature and apparently ready to pupate; so of the early molts and even of the full grown larvæ we cannot give a satisfactory description. Those observed were rather contracted, spindle-shaped, whitish, with a reddish-brown head, sparsely haired.

Pupation occurs during last two weeks of August and is in nearly all cases completed by the last of the month.

The pupæ are dark brown, six mm. long, and no distinctive characters that would separate them from related species were detected. The cocoon is thin but of tough, close woven silk. In forming the cocoon the larva attaches itself to the blossom end of the berry by means of the caudal prolegs and then builds the cocoon which practically fills the cavity of the shriveled berry.

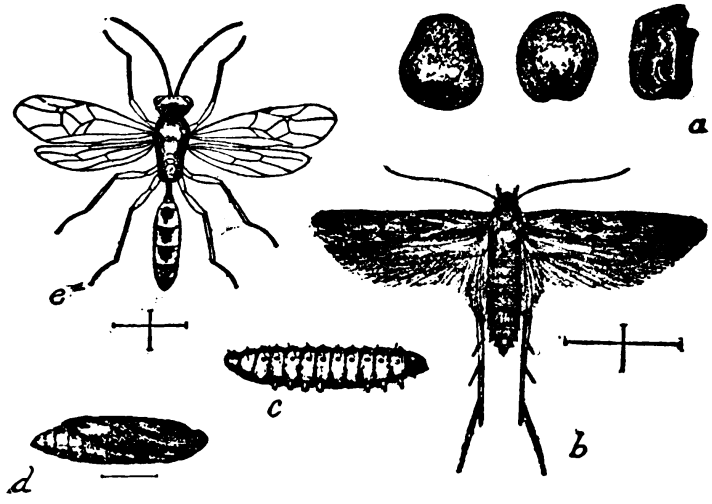


FIG. 1. (*Gelechia sp.*) *a*, injured berries. *b*, moth. *c*, mature larva. *d*, pupa. *e*, parasite *Centeterus suturalis*.

Moths first appeared October 3d, so the period of pupation may be stated as from two to three weeks.

The moth shown at *b* in Fig. 1 is of a gray color with darker spots on the wings. It closely resembles *G. quercifoliella*.

Out of the 130 berries containing pupæ mentioned above we secured four specimens of moths. This low per cent of adults is due to the fact that a large proportion of the pupæ, over 100, were destroyed by a fungus, apparently quite similar to Sporotrichum, and of the remainder a number were attacked by a Hymenopterous parasite (*Centeterus suturalis Ash*), seven of which issued prior to September 24th.

The fungus was not observed to attack healthy berries, always making its appearance after the hole had been made near the stem, and, while it seemed to develop in the tissues of the berry, there seems scarcely any doubt but that it is a parasite of the insect. Some of the Hymenopterous parasites issued from berries showing fungus growth, so that it would appear possible for these to resist the fungus, even when pupæ were infected with it; that is, supposing the fungus to infest primarily the *Gelechia*. Doubtless a parasitized larva would be a more easy victim of fungus attack.

The appearance of moths so late in the season, the impossibility of their producing another brood, and the improbability of their depositing eggs in any situation where they would winter and assure the larvæ access to their food plant the following spring, almost forces us to the conclusion that the moths hibernate and deposit eggs when ground cherries bloom the following season. This view is strengthened by the fact that a specimen was captured in an office room of one the college buildings December 7, 1894. Nevertheless, so long an existence of the adult for so delicate a lepidopterous insect seems doubtful, and the possibility of some pupæ hibernating or of a spring brood of larvæ, even in some situation different from the berries of *Physalis*, must not be overlooked.

This species, as already intimated, very closely resembles *G. quercifoliella*, and it was so determined with some doubt by Mr. Marlatt from specimens sent to Washington for identification. The fact that it affects a totally different plant indicates it to be quite distinct from that species. It is certainly different from *physaliella* as described by Chambers, and has a totally different larval habit, that species being said to mine the leaves of *Physalis* in September, to pupate in leaves and rubbish on the ground, and to issue as adult in April. Still another species described as *physalivorella* was thought possibly to represent our form, though no record of its larval characters or habits were accessible. Mr. Marlatt has, however, kindly

compared our specimens with three specimens of *physalivorella* in the National museum, and states, "these are very distinct from your specimen." "The latter agrees quite well with G. quercifoliella, but may be a distinct species."

From this it seems most probable that this insect is undescribed, but we prefer to leave the technical description to some specialist in this group of delicate and inetresting moths.

ON THE EARLY STAGES OF THE IMBRICATED SNOUT BEETLE.

(*Epicaerus imbricatus* Say.)

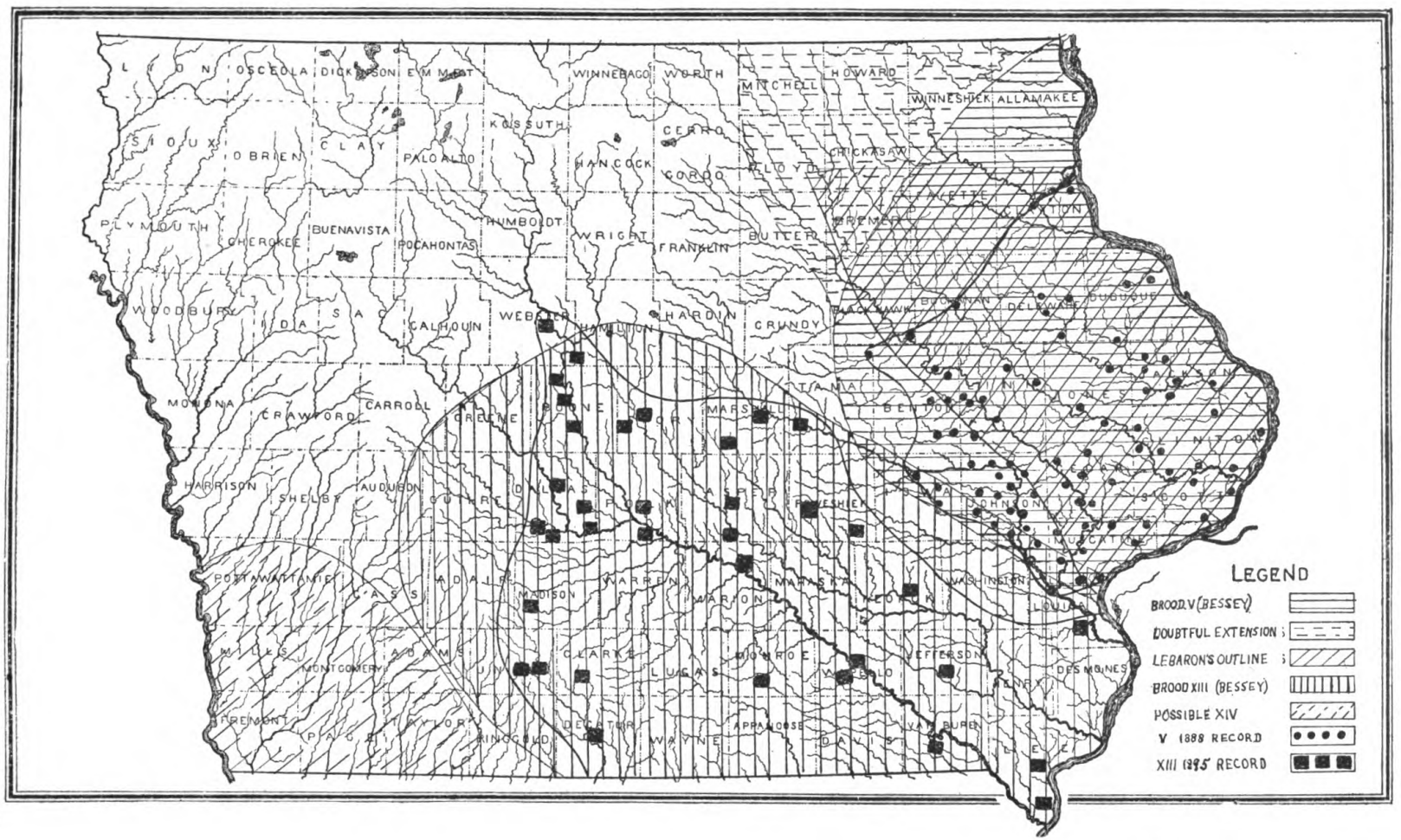
While this species has been recognized as a pest since its first economic treatment by Walsh in 1863, our knowledge of its life history has remained as meagre as at that time, nothing being known as to its early stages, except the record of egg laying by Professor Forbes.

This led us, on receiving specimens of the beetle with the report of their injury to strawberry plants, to attempt their breeding upon this food plant. While we did not succeed in tracing the full history of the species, the securing of eggs and the partial development of the larvæ, and the possibility that this clue may assist in the further elucidation of its history is our excuse for presenting this fragmentary account.

On May 14, 1895, the adults were placed on a strawberry plant having three or four open leaves and a number of small berries. They immediately crawled up the stems and soon began feeding upon the leaves, cutting a crescent corresponding to a line described by the end of the snout. The crescent was apparently quite uniform but soon became irregular when the beetle had to move in order to reach the tissue; so in reality there is no regularity in devouring the leaf and finally nothing is left but the veins and a few angular fragments of leaves. By the following day the effect on the leaves was quite apparent, the beetles eating rapidly, and by the 20th the leaves were all devoured except a few dry, curled pieces and the stems. They did not attack the berries, but in some cas s ate the sepals at the base.

The beetles began pairing the first day and continued for five or six days. No eggs were observed till the 21st when a number of small, white, glistening eggs were found under a fold of a leaf and as no folded or dry leaves had been left on the plant these eggs had certainly been deposited by the *Epicaerus*. On the 22d another leaf containing eggs was found

PLATE XV.



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and these, with those previously found, were placed by a fresh leaf that had been carefully freed from all matter that might possibly contain eggs of other species, and the beetles removed to avoid possibility of their injuring the egg. The eggs appeared in all cases to be protected by a fold of leaf carefully glued down.

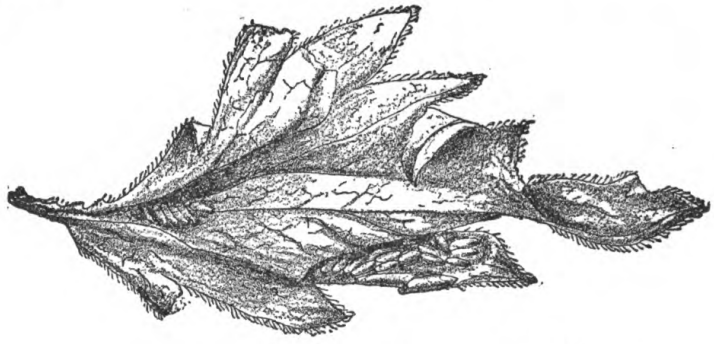

FIG. 8. *Epicaerus imbricatus* eggs. (Drawn by Miss King.)

Forbes[1] says of *Epicaerus* that they "were found by experiment to feed freely on pear leaves, and also to lay their eggs upon these leaves, concealing their deposit by gumming another leaf to the surface."

The eggs are 1.3 mm. long, glistening white, nearly cylindrical, sometimes very slightly curved, the ends broadly rounded, the surface smooth, transparent and the shell very thin.

The first larvæ to hatch escaped before being seen, the empty shells being first noticed on the 30th. Hatching therefore occurs within ten days from time of deposition. Other eggs isolated and kept under close observation showed that the larvæ immediately work their way into the ground and these observed in root cages, during the following three weeks, could be seen to move about among the roots and as they very evidently increased in size and appeared to thrive it is safe to say that they fed upon the roots of the strawberry plant.

The death of the plants in the root cages and the loss of the larvæ unfortunately brought the observation to an end.

The young larvæ are two mm. long, without any trace of eyes or legs. They are yellowish-white in color, the head from above oval with a few strong bristles and the mandibles very conspicuous. The maxillary and labial palpi are short, stumpy and in the living larvæ stand out rather prominently from the under side of the head. The body segments are provided with a few small hairs.

[1] Sixteenth Report State Entom., Ill. p. 76.

Adult beetles have been observed in autumn, as early as August, but the probability is that only one brood occurs each year, the adults surviving the winter.

This fragmentary result enables us to say with certainty that the eggs are deposited in dry and folded leaves of the food plants of the adults and that the larvæ immediately enter the ground to feed upon the roots. To this extent they show what measures of control must be adopted for this insect.

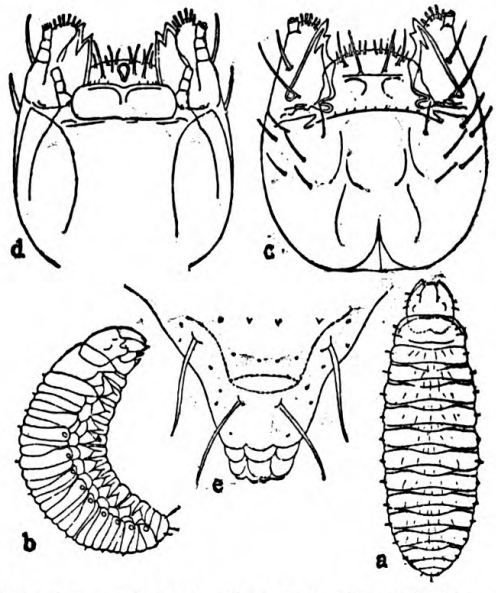

FIG. 9. *Epicaerus imbricatus*. *a*, *b*, young larva, back and side view. *c*, head above. *d*, head below. *e*, terminal segment. (From drawings by Miss King)

THE COSMOS WEEVIL.

(*Baris confinis Lec.*)

This weevil, Fig. 4, was found September 1, 1895, to work very extensively in the root-stocks and the base of the larger branches of *Cosmos bipinnata* causing the ultimate destruction of the plant. The presence of the insect is first manifested by

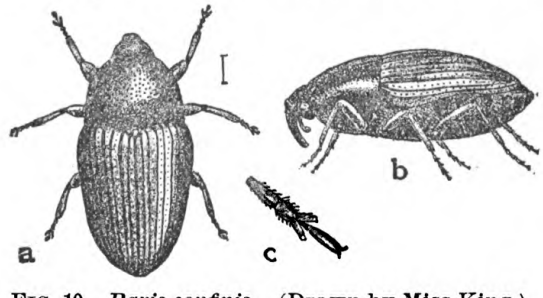

FIG. 10. *Baris confinis*. (Drawn by Miss King.)

the breaking off of the larger branches. By examining the base of these branches, and especially the root-stock, it will be

found that numerous white larvæ and pupæ about one-eighth inch long are present and working in the woody tissue of the plant. They make small tunnels, packing the borings around them much as does the potato-stalk-weevil. They pupate in these tunnels and emerge as a small black beetle.

The adult when first formed is white and takes on the black color gradually, beginning on the head and thorax and then extending backward to the scutellum and base of elytra and then gradually over the whole body.

The adults are quite active but drop to the ground as soon as disturbed and remain very quiet for some time.

Specimens of the adults kept on plants under observation in the laboratory worked in the young tender tissues, either eating into the terminal portions or into the stems at the axils of the leaves, almost burying themselves and finally causing the small leaf or branch to break down, as do the larger branches. They were not confined entirely to the parts just mentioned but would eat into the little leaflets as they were expanding, thus preventing their complete opening.

One individual was found boring into the end of a broken stem making its way into the pith and almost disappearing in a short time. It remained in that position for some time. Thinking that it might be a female and that the eggs were being deposited, the cavity was examined at the end of four or five days, but no eggs were found. This adult was placed on a growing plant and soon began feeding in the young tissues as stated above. On one small plant in the laboratory the young leaves were so badly eaten into that the plant died in a short time.

One specimen was taken while collecting in the woods August 31st. So the species undoubtedly infests other plants besides the one recorded above.

Nothing can be stated concerning oviposition and the early larval stages. As stated above, numerous fully grown larvæ and pupæ were found in the root-stock and base of the larger branches September 1st. A few fully colored adults were found a few days later. One root-stock was isolated during the second week in September and adults kept gradually issuing until about the middle of October. From this one root-stock as many as twelve to fifteen specimens issued besides the numerous larvæ and pupæ that were removed for the purpose of examination.

Since no eggs were deposited by the specimens kept under observation and adults were still very active after the plants

had all been killed by frost, it is quite safe to say that they hibernate and deposit eggs the next spring, there probably being but one brood each year.

A nearly related species, determined at the Division of Entomology, U. S. Department Agriculture, as *Baris dolosa* Casey, was bred in small numbers from the same stems. It was thought to be the same and differences in appearance due to imperfect maturing, but there is a decided difference in form of thorax and it seems probable that both species breed in the same plant and with practically the same life history.

DESCRIPTIONS.

Larva: Fig. 11, a. The fully grown larva is about 5-32 in. long and 1-16 in. diameter, and a yellowish-white color; head light brown, mandibles reddish-brown; legs represented by mammiform protuberances. The body tapers somewhat toward posterior end, the last segment usually showing four bristles.

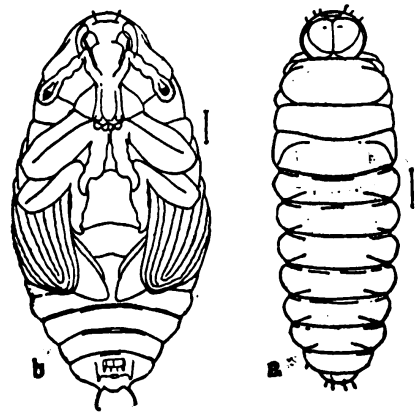

FIG. 11. *B. confinis*. *a*, larva. *b*, pupa.

Pupa: Fig. 11, b. About the same length as larva, but comparatively wider. Head (from beneath) fits closely to the body, eyes not especially prominent; antennæ wide in proportion to the length, normally not projecting beyond the sides of the thorax, club conspicuous, usually somewhat denser in appearance. Snout reaches base of first pair of legs and shows small, roundish portions at tip corresponding to the mouth-parts. First and second pair of legs clumsy in appearance; joints of the tarsi indicated, the last one distinctly curved; third pair of legs hidden, only a slight portion being visible along the inner margin of the hind wing-pads. Four abdominal segments visible for their entire width. The last segment usually has two apical bristles and a group of small spiny processes.

Adult Fig. 10. (a, dorsal view; b, side view; c, tarsus.) Widest at base of elytra and tapers strongly toward either end; shining black, glabrous; numerous medium sized punctures on the thorax and between the striæ of the elytra. Snout about 1-24 inch long, curved, usually extending directly downward, but sometimes drawn backward or slightly projected forward. Thorax narrows perceptibly toward the head. Tarsi strongly pubescent beneath, claws strongly curved, diverging. Elytra emarginate at tip, making the tip of abdomen more distinctly visible from above.

REMEDIES.

Collecting and burning the old root-stocks and stems in early autumn will be the most effective treatment that can be suggested from present knowledge of the species.

AN INSECT OCCURRING IN WATER TANKS AND RESERVOIRS.

(*Chironomus* sp.)

Early in July I received some specimens of a slender red larva from Boone, with the following letter:

Professor Osborn:

DEAR SIR—Enclosed I send a sample of the worm that appeared in our city water about a week ago in countless numbers. Would like to know what they are and where they would be likely to come from. The water we use comes from a 3,000-foot well, but about two weeks ago our pumps failed and we were supplied with water from a forty-five foot vein owned by the C. & N. W. Ry. Co., and pumped to our reservoir through a hose.

Yours truly, E. E. CHANDLER,
Chairman Water Committee.

Boone, Iowa.

The larvæ were evidently *Chironomus*, and in replying to the letter it was so stated and that in themselves they could be considered harmless, though of course the presence of masses of such ugly looking creatures would be objectionable, and if dying in the water they might become a source of pollution Also that the larvæ must have gained access to the water from the eggs of the adult mosquito-like insect being deposited in the reservoir or the mains by which it was filled. They could not be derived from a deep well. It was suggested that provision be made to exclude the insects from the water to prevent deposition of eggs.

The larvæ (Fig. 12) *a* and *b*, which are an inch or a little more in length and of a light red color with green reflections on the sides near the head, construct a tube at the bottom of

the water in which they live, and in this remain protected and from it extend themselves to obtain food. The food is for the most part apparently minute aquatic organisms, algæ, etc. Their presence might be considered a means of clearing water of such matter did they not at times become so numerous as to prove an element of danger.

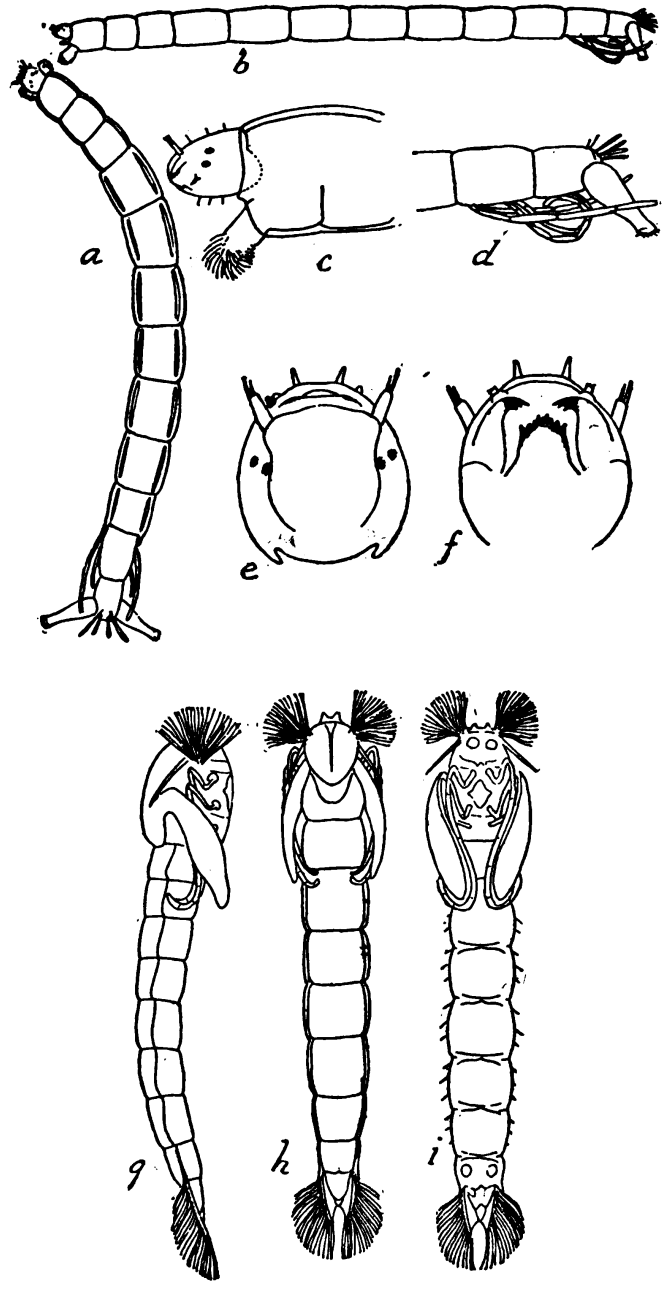

FIG. 12. (*Chironomus sp.*) *a*, larva, dorsal view. *b*, side view. *c*, head and first segments of body. *d*, terminal segments of body showing appendages. *e*, upper surface of head. *f*, lower surface of head. *g*, side. *h*, dorsal. *i*, ventral view of pupa. (Original, drawn by Miss King.)

Later in conversation with Mr. G. W. Brown, a civil engineer of Boone, it was learned that the water was pumped into a large cement-lined reservoir which contained the larvæ in immense numbers and was without question the point where the eggs were laid, it being exposed to easy access by insects. It appeared also that the larvæ were drained into the mains at times when the reservoir was low, doubtless causing strong currents over the bottom. Specimens have also been received from Des Moines.

When mature they change to a delicate pupa (Fig. 12, *g*, *h*, *i*,) and then rise to the surface of the water and soon the adult insect escapes from a slit along the back of the pupa case.

The adult is a delicate mosquito-like insect (Fig. 13.) belonging to the genus *Chironomus* but it cannot be referred to any of the described species and the present state of the classification of this genus is such as not to warrant us in giving it a scientific name or description.

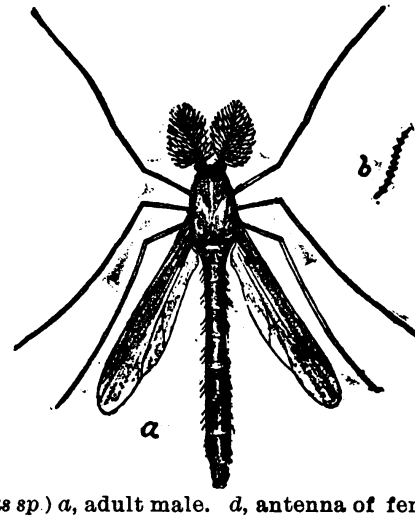

FIG. 13. (*Chironomus sp.*) *a*, adult male. *d*, antenna of female. (Original).

The insect is of interest at this time because of the great number of water tanks and reservoirs established, not only in cities and towns, but on many farms, and the probability of its frequent occurrence where these are open to visits of the adults.

Exclusion of the adults, where practicable, may be accomplished by the use of ordinary mosquito netting or wire gauze. Where this is impracticable the providing of an inlet to distributing pipes that will draw water from a few inches above the bottom of the reservoir (which might further be protected by a fine screen) will, it is believed, avoid the distribution of the worms in the mains.